



# Daffodil International University

Department of Software Engineering  
Faculty of Science & Information Technology

Final Examination, Fall 2024

Course Code: MAT 101 ; Course Title: Mathematics I

Sections & Teachers: All

Time: 2:00 Hrs

Marks: 40

Answer **ALL** Questions

*[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]*

1.	a)	Describe inflection point with example.	[Marks-01]	CLO-1 Level-2
	b)	Classify the maxima-minima of the function: $f(x) = \frac{1}{6}x^6 - 12x^5 + 36x^4 + 6$	[Marks-06]	
2.	a)	If $u = \ln\sqrt{(x^2 + y^2 + z^2)}$ , then express $(x^2 + y^2 + z^2) \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right) = 1.$	[Marks-04]	CLO-1 Level-2
	b)	Explain Euler's theorem. Also using it express $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{4} \sin 2u$ , when $u = \tan^{-1}(\frac{x+y}{\sqrt{x}+\sqrt{y}})$ .	[Marks-04]	
3.	a)	Solve the following integrals: i. $\int \cos x \cos 4x \cos 5x \, dx$ ii. $\int \frac{\tan x \sec^2 x}{a^2 + b^2 \tan^2 x} \, dx$ iii. $\int (\sin^{-1} x)^2 \, dx$ iv. $\int_0^\pi \frac{dx}{2 + \cos x}$	[Marks- 2.5×4=10]	CLO-2 Level-3
4.	a)	Examine the area of the circle: $x^2 + y^2 = 16$ .	[Marks-05]	CLO-2 Level-3
5.	a)	Using Gamma-Beta function analyze the followings: i. $\int_0^1 x^{\frac{5}{2}} (1-x)^{\frac{3}{2}} \, dx$ ii. $\int_0^{\frac{\pi}{2}} \sin 2x \cos^6 x \, dx$	[Marks- 2×5=10]	CLO-3 Level-4